

Device and method for determining tone ringing frequency

PATENT CLAIMS

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1. A method for determining tone ringing frequency, with the following steps:

10 forming a ZC signal from a tone ringing signal by comparing the tone ringing signal with a threshold (S), the ZC signal having a succession of alternately rising and falling edges between two ZC signal values;

15 measuring the respective time duration between the adjacent rising and falling edges of the ZC signal;

20 comparing the measured time durations with a predetermined time duration limit value ( $t_g$ );

25 defining an evaluation start time ( $t_1$ ) if a measured time duration is greater than or equal to the time duration limit value ( $t_g$ ), the evaluation start time ( $t_1$ ) being the instant of the subsequent edge;

30 defining an evaluation stop time ( $t_2$ ) if a measured time duration with an identical ZC signal value to the next-but-one instance is greater than or equal to the time duration limit value ( $t_g$ ),

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the evaluation stop time ( $t_2$ ) being the instant of the subsequent edge; and

5 determining the frequency ( $f$ ) on the basis of the measured time difference between the evaluation start time ( $t_1$ ) and the evaluation stop time ( $t_2$ ).

10 2. The method for determining tone ringing frequency as claimed in claim 1, characterized by the following steps:

defining a monitoring time window ( $T_u$ ,  $T_o$ ) for the frequency determination; and

15 discontinuing the measurement if the time measured since the evaluation start time ( $t_1$ ) lies outside the monitoring time window.

20 3. The method for determining tone ringing frequency as claimed in one of the preceding claims, characterized in that the time duration limit value ( $t_g$ ) is defined as a constant.

25 4. The method for determining tone ringing frequency as claimed in either of claims 1 and 2, characterized in that a value which is as great as possible is defined for the time duration limit value ( $t_g$ ), with which the attempt to define the evaluation start time ( $t_1$ ) is commenced; and this value is reduced in accordance with a predetermined algorithm if no evaluation start time ( $t_1$ ) can be defined after a certain time.

5. A device for determining tone ringing frequency, with:

5 a ZC signal generating means for forming a ZC signal from a tone ringing signal by comparing the tone ringing signal with a threshold (S), the ZC signal having a succession of alternately rising and falling edges between two ZC signal values;

10 a measuring means for measuring the respective time duration between the adjacent rising and falling edges of the ZC signal;

15 a comparison means for comparing the measured time durations with a predetermined time duration limit value ( $t_g$ );

20 a defining means for defining

25 i) an evaluation start time ( $t_1$ ) if a measured time duration is greater than or equal to the time duration limit value ( $t_g$ ), the evaluation start time ( $t_1$ ) being the instant of the subsequent edge;

30 ii) defining an evaluation stop time ( $t_2$ ) if a measured time duration with an identical ZC signal value to the next-but-one instance is greater than or equal to the time duration limit value ( $t_g$ ), the evaluation stop time ( $t_2$ ) being the instant of the subsequent edge; and

a frequency-determining means for determining the frequency (f) on the basis of the measured time difference between the evaluation start time ( $t_1$ ) and the evaluation stop time ( $t_2$ ).

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6. The device for determining tone ringing frequency as claimed in claim 5, characterized in that the defining means for defining a monitoring time window ( $T_u$ ,  $T_o$ ) is designed for the frequency determination and for discontinuing the measurement if the time measured since the evaluation start time ( $t_1$ ) lies outside the monitoring time window.

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7. The device for determining tone ringing frequency as claimed in either of the preceding claims 5 and 6, characterized in that the defining means defines the time duration limit value ( $t_g$ ) as a constant.

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8. The device for determining tone ringing frequency as claimed in either of claims 5 and 6, characterized in that the defining means defines a value which is as great as possible for the time duration limit value ( $t_g$ ), with which the attempt to define the evaluation start time ( $t_1$ ) is commenced; and this value can be reduced in accordance with a predetermined algorithm if no evaluation start time ( $t_1$ ) can be defined after a certain time.

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